MANAGEMENT OUTCOMES OF ACQUIRED EAR DEFECTS

A dissertation submitted to

THE TAMILNADU DR.M.G.R.MEDICAL UNIVERSITY

in partial fulfilment of the requirements

for the degree of

M.Ch.

(PLASTIC AND RECONSTRUCTIVE SURGERY)

Branch III

AUGUST, 2013

DEPARTMENT OF PLASTIC SURGERY
COIMBATORE MEDICAL COLLEGE HOSPITAL
COIMBATORE

CERTIFICATE

This is to certify that this dissertation entitled **"MANAGEMENT OUTCOMES OF ACQUIRED EAR DEFECTS"** submitted by **DR.VIMALASOWNDARAVALLI DEVARAJ** to the faculty of Plastic Surgery, **The TamilNadu Dr. M.G.R Medical University, Chennai**, in partial fulfilment of the requirement for the award of the degree of **MASTER OF CHIRURGIE IN PLASTIC AND RECONSTRUCTIVE SURGERY, BRANCH III** for the August 2013 examination, is a bonafide research work carried out by her under our direct supervision and guidance

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DECLARATION

I, **DR.VIMALA SOWNDARAVALLI DEVARAJ** solemnly declare that the dissertation entitled "**MANAGEMENT OUTCOMES OF ACQUIRED EAR DEFECTS"**, is a bonafide work done by me at Coimbatore Medical College Hospital, during 2011 – 2013 under the guidance and supervision of my Chief **Prof Dr.N.SEKAR M.S(Ortho), M.Ch(Plastic).** The dissertation is submitted to **The Tamil Nadu Dr.M.G.R Medical University, Chennai**, towards partial fulfilment of the requirement for the award of the degree of **MASTER OF CHIRURGIE IN PLASTIC AND RECONSTRUCTIVE SURGERY, Branch III**.

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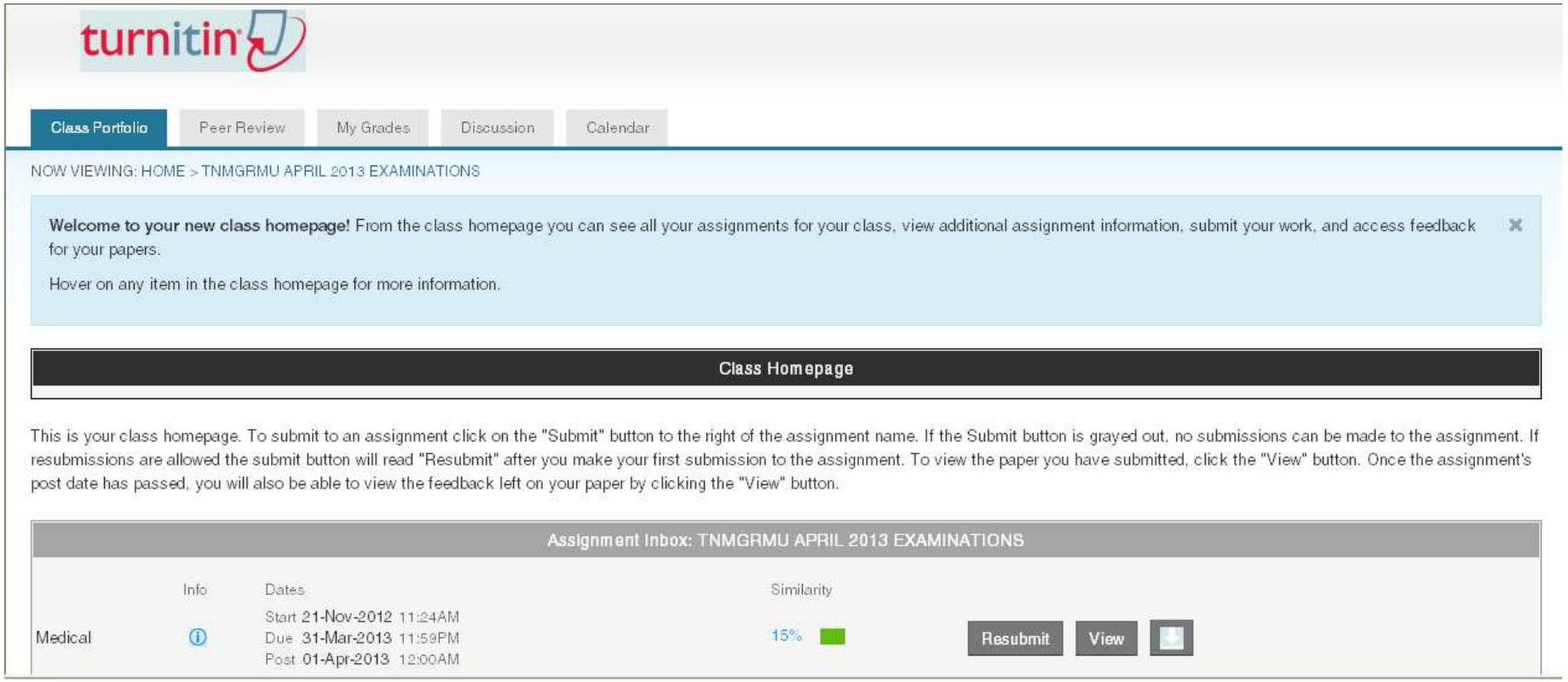
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MANAGEMENT OUTCOMES OF ACQUIRED EAR DEFECTS A dissertation submitted to THE TAMILNADU DR.M.G.R.MEDICAL UNIVERSITY in partial fulfillment of the requirements for the degree of M.Ch. (PLASTIC AND RECONSTRUCTIVE SURGERY) Branch III AUGUST, 2013. DEPARTMENT OF PLASTIC SURGERY COIMBATORE MEDICAL COLLEGE HOSPITAL COIMBATORE CERTIFICATE This is to certify that this dissertation entitled “MANAGEMENT OUTCOMES OF ACQUIRED EAR DEFECTS” submitted by DR.VIMALASOWNDARAVALLI DEVARAJ to the faculty of Plastic Surgery ,The TamilNadu Dr.M.G.R Medical University, Chennai , in partial fulfilment of the requirement for the award of the degree of MASTER OF CHIRURGIE IN PLASTIC AND RECONSTRUCTIVE SURGERY,BRANCH...

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Finally, I will be failing in my duty if I don't thank my patients who have been my greatest source of inspiration in my work.

Dr Vimala Sowndaravalli Devaraj

ABSTRACT

External ear reconstruction presents many challenges for the Plastic surgeon because of its unique structure. Despite its unique challenges, ear reconstruction is not without its own set of disappointments and frustrations for both the reconstructive surgeon and patient. To avoid such frustrations the outcome of reconstruction of the acquired ear defects were analysed both by the surgeon and the patient to find a reconstructive option that will satisfy both of them. In our study period over 22 months, 20 patients with acquired ear defects were reconstructed ,out of which full thickness defect was predominant (65%).Retro auricular flap was the commonest surgery (20%), followed by skin to skin repair, Dieffenbach technique and temperoparietal fascia flap, each being 15%. Final Outcome was analysed by the surgeons and the patient. The conclusion drawn from the study was that inspite of the varied anatomical location and extent of the defect, and whatever procedure is performed while reconstructing ear, thin, pliable flaps with good contour and colour match should be chosen and it should be completed in one or two stages, giving equal priority for the donor site scar as for the ear.

CONTENTS

Introduction

INTRODUCTION

External ear reconstruction presents many challenges for the Plastic surgeon because of its unique structure. The goal of external ear reconstruction is to achieve an ear as normal as possible in appearance and position . The shape, orientation, and size of the reconstructed ear must match its counterpart as closely as possible. The postauricular sulcus must be preserved , and the relationship of the retro auricular skin to the scalp should be maintained.

The reconstructive efforts are complicated by the features that include an unusually high ratio of cartilage to skin and the limited and variable blood supply. The success of auricular reconstruction lies with thin, well – vascularised skin coverage. Local and regional flaps need to be carefully chosen and executed, to reconstruct the intrinsic anatomy of the ear.

The ear, because of its protruding position and exposed nature is prone for injuries frequently. Ear deformities has to be corrected not only for aesthetic purposes but also for wearing ornaments especially in women.

Despite its unique challenges, ear reconstruction is not without its own set of disappointments and frustrations for both the reconstructive surgeon and patient. Underestimation of the requirements of skin and cartilage needed will lead to multiple revisional surgeries,with the risk of increased scar formation and decreased vascularity at each stage. However, if the Plastic Surgeon sticks to well - established principles, the rewards of ear reconstruction will surpass those obtained from all other types of reconstructive surgery.

Above unique features of ear and the challenges involved in reconstruction provoked me to study the various acquired defects of the ear, their management and assessment of management outcomes in subjective and objective terms.[1]

The defects were patterned using template of the contralateral ear and appropriate flaps were planned and executed. Cartilage, if needed, was harvested from ipsilateral or contralateral ear or coastal cartilage. Reconstruction was carried out in single or multiple stages.

In case of keloid, preoperative intralesional steroids were given , followed by surgery and periodic follow-up to look for recurrence.

Final contour, colour match, bulkiness , stages of reconstruction and donor site morbidity were studied. Finally aesthetic outcome was

assessed by the surgeon(s) and patient. The scoring was done using excellence scale as Excellent – 5, good-4, fair – 3, poor -2,unacceptable-1. Few conclusions were obtained from the study.

This is a descriptive prospective study conducted in the Department of Plastic Surgery, Coimbatore Medical College Hospital from June 2011 to January 2013 involving 20 patients with acquired ear defects.

Aims and Objectives

AIMS AND OBJECTIVES

1. To study the various types of acquired defects of ear classified based on etiology and anatomical location of the injury.

2. Planned for immediate or delayed reconstruction using template based on individual patient needs.

3. Follow up of patients for complications, persistence of defect and donor site morbidity.

4. Subjective assessment of final outcome after reconstruction based on contour, colour match ,bulkiness of the reconstructed part of the ear, donor site morbidity ,stages of reconstruction and surgeon satisfaction.

5. Objective assessment of final outcome after reconstruction based on contour, colour match, bulkiness of the reconstructed part of the ear , stages of reconstruction, donor site morbidity and patient satisfaction.

Review of Literature

REVIEW OF LITERATURE

HISTORICAL PERSPECTIVE

The earliest reports of external ear reconstruction is given in ***Sushruta Samhita*** in ***600 BC,*** in which the ear lobe reconstruction using local skin flaps is being described by the great Indian surgeon **Sushruta.**

In the **16th century**, **Gaspare Tagliocozzi** described the arm flap to reconstruct the ear. The first description of a total ear replantation was reported in **1551**.

In **1845, Johann Friedrich Dieffenbach (1794–1847)** described the upper part of the ear reconstruction.

The 20^{th} century is the beginning of the modern era of auricular reconstruction. The use of costal cartilage grafts in reconstructing the external ear was first described by **Harold D. Gillies (1882–1960)** in **1920**. In the mastoid region, first he buried an autologous ear framework fabricated from autologous rib cartilage first . Later he separated the skin of the mastoid area by means of a cervical flap.

In **1930, Pierce** described the principle of creating an auricular framework from cartilage grafts. **Tanzer** further popularized the use of autogenous rib cartilage for ear reconstruction. **Brent** improved the

standards of external ear reconstruction using autogenous materials and successfully used tissue expansion in ear reconstruction.[2]

Crikelair first described **Banner flap** which consists of auriculocephalic sulcus based supra-auricular skin, used to reconstruct upper third defects. The raised skin is folded over the defect. A small cartilage graft can be used to ensure structural stability.

Converse in **1958,** was the first to propose Tunnel procedure for correcting defects of upper and middle third helix.[3]

Noshir Hormasji Antia is an Indian Plastic surgeon was born into a middle class Parsi family in Mumbai on 8th February 1922. In 1958 he established the first plastic surgical centre in Western India in Mumbai . He pioneered Plastic surgery in leprosy, burns , facial prosthesis, rehabilitation and research in neurobiology, immunology of leprosy, and immunological response in thermal injuries.

He was known for his procedure for ear repair(helical rim upto 3 cm) using chondrocutaneous flaps. [4]

Argamoso and Lewin, modified the Antia-Buch flap for repairing middle-third helical defects upto 3 cm. They rotated a superiorly and inferiorly based chondro cutaneous flaps together at the site of a wedge excision or defect.

The pocket principle was described by **Mladick** in **1971**. The auricular cartilage is salvaged from the amputated or avulsed ear by this procedure. The skin of the amputated or avulsed part of the ear is cleaned. Perichondrium can be preserved, if available. The retrieved cartilage is then anchored to the ear in its appropriate anatomical location and then buried in a retro auricular pocket and left in place for 2 weeks. By this procedure, the cartilage maintains its blood supply. After 2 weeks, the pocket is elevated and the amputated part is allowed to heal by secondary intention over several weeks

Island chondrocutaneous postauricular flap, was first reported by **Masson in 1972**.It is used to repair conchal bowl lesions after trauma or tumor excisions .

Chondrocutaneous conchal flap was first proposed by **Davis** in **1974**. The flap is used to reconstruct upper third defects of the ear with a postauricular subcutaneous pedicle flap . The donor site of the postauricular subcutaneous pedicle flap is covered with split thickness skin graft.

The first successful replantation of a completely amputated ear by microvascular anastomosis was performed in **1980, by Pennington** . Since then, 25 successful cases of microvascular replantation of ear have been reported in the literature.

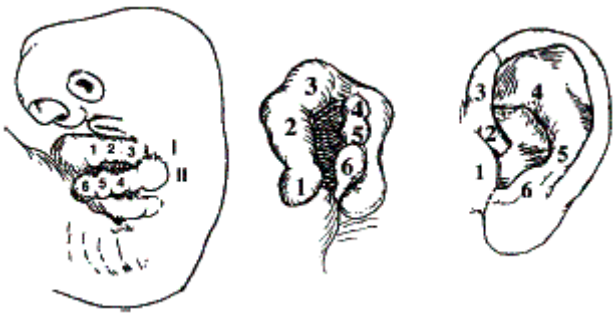
More **recent innovations** have also included the use of **alloplastic frameworks,** incorporation of **temporoparietal fascia flaps**, and osseointegrated implants for the anchoring of prosthetic auricles and **cartilage fabrication by tissue engineering**. The source of chondrocytes for tissue engineering can be derived from articular cartilage, auricular cartilage , autologous perichondrium, rib, allogenic perichondrium, bone marrow, periosteum, and adipose tissue.

The recent advances in transplant immunology and surgery will make **the transplant of cadaveric ear** possible in the near future. By tissue engineering, the manufacturing of biocompatible synthetic cartilage is possible and through this custom repair of injured ear with preservation of normal anatomy can be achieved. [3]

EMBRYOLOGY AND ANATOMY OF THE EXTERNAL EAR

EMBRYOLOGY

The development of the external ear is initiated by the appearance of six tissue elevations, the auricular hillocks, which form around the margins of the dorsal portion of the first pharyngeal cleft.



(Left) Hillock formation in an 11-mm human embryo.(middle) Hillock configuration in a 15-mm embryo .(right) Adult ear depicting the hillock derivations.

ANATOMY OF THE EXTERNAL EAR

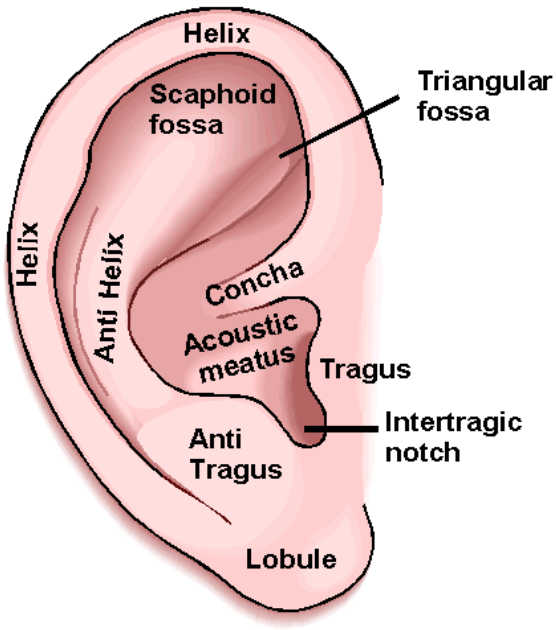
The ear can be divided into external , middle and internal ear. The external ear comprises two structures, the auricle, or pinna and the external acoustic meatus.

THE AURICLE

The lateral surface of the ear is irregularly concave , it turns slightly forwards and has numerous eminences and depressions. Its prominent curved rim is helix and it usually bears postero-superiorly a small auricular tubercle.

Another curved prominence which is parallel and anterior to the posterior part of the helix , is the antihelix. It divides above into two crura encircling a depressed triangular fossa. The depression between the helix and antihelix is the scaphoid fossa. The antihelix encircles the concha of the pinna . It is incompletely divided by the crus of the helix: the conchal area above this is the cymba conchae, below the crus of the helix is the tragus, partly overlapping the meatal orifice.

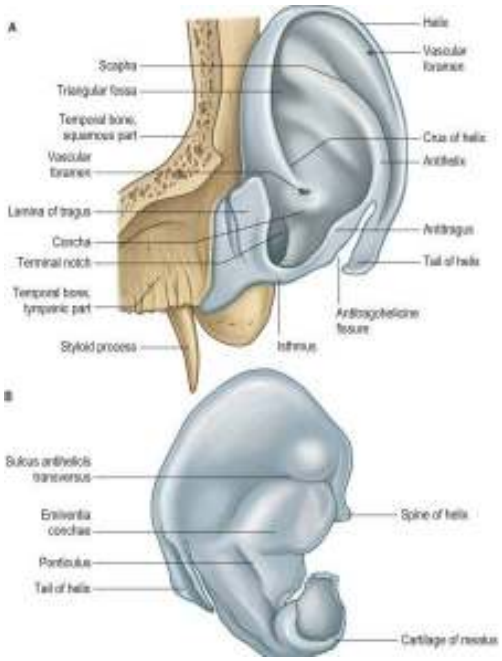
Opposite the tragus is a small tubercle , the antitragus. Below this is the lobule. It is composed of fibrous and adipose tissues, and is soft , unlike the majority of the parts of the ear supported by elastic cartilage, is firm. The medial surface of the ear presents elevations corresponding to the depressions on its lateral surface.



Dimensions and Proportions of External Ear

THE AURICULAR CARTILAGE

The auricle or pinna is a single thin plate of elastic fibrocartilage. It is covered by skin, its surface marked by eminences and depressions . It is connected to the surrounding parts by ligaments and muscles. It is continuous with the cartilage of the external acoustic meatus. There is no cartilage in the lobule and also absent between the tragus and the crus of the helix.[5]



The auricular cartilages of the left ear A.Lateral surface B.Medial surface

The extraordinary flexibility of the ear cartilage and its ability to maintain sophisticated form differentiates it from the more rigid cartilage of the nasal septum or rib ,. Hence reconstruction involving rib or septal cartilage will result in loss of this flexibility[1] yet currently these are the most acceptable of the alternatives.[6]

THE AURICULAR MUSCLES

The **extrinsic muscles** of the auricle are the Auriculares anterior, superior, and posterior.

The ***intrinsic*** **muscles** : 1. The *Helicis major* 2.The *Helicis minor* 3.The *Tragicus* 4.The *Antitragicus* 5.The *Transversus auriculae* 6.The *Obliquus auriculae,*[5]

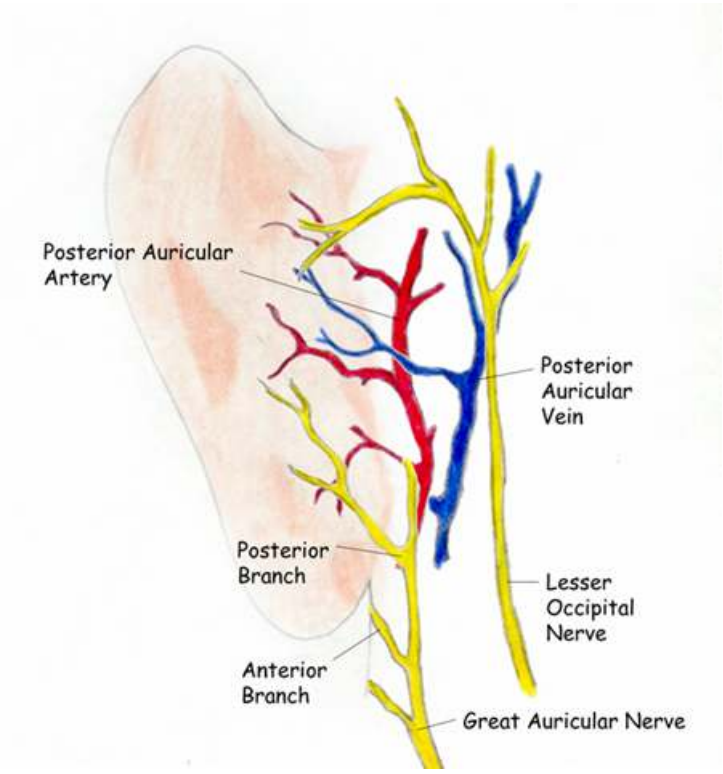
Anatomic landmarks of the auricle are important while considering the reconstructive options.[6]

The distinct three-dimensional components that comprise the cartilaginous framework are the conchal complex, the antitragal and antihelical complex, and the helical and lobular complex. Understanding the importance of these cartilage containing units is essential while planning the reconstruction of defects which are involving structurally important cartilage – containing zones. [1]

The conchal bowl is the least significant of cartilage containing zones as it contributes minimally to the ear support, size or shape of the ear. Hence conchal cartilage can be used as donor cartilage grafts in repairing of ipsilateral or contralateral defects without disturbing the donor site support or contour.[2]

BLOOD SUPPLY OF THE EAR

The arterial supply to the auricle is derived from branches of the superficial temporal artery anteriorly and the posterior auricular artery posteriorly, both being branches of the external carotid artery. The lateral surface is supplied by both the PAA and STA , they create two arterial networks, one is the triangular fossa- scapha network and is supplied by the helical branch of the STA , while the conchal network is supplied by the posterior auricular artery , they give septal perforators to the conchal bowl .



Blood and nerve supply of the medial(posterior) surface of the ear

Perforators of the posterior auricular artery and its arterial network in anteroauricular skin:

When its courses under the concha, the posterior auricular artery gives multiple perforating branches to the anterior auricular skin. These are perforators to the triangular fossa, helical root, cymba conchae, cavum conchae, and earlobe. These perforators communicate with the upper branch of the superficial temporal artery on the anterior skin of the ear. The posterior auricular artery is the main supply for the anterior auricular conchal network, through these perforating branches. The two arterial territories have abundant interconnections, allowing a more options of flap design on the auricle[7].

Venous drainage of the auricle is through the posterior auricular vein, which drains into the external jugular vein. Supplemental venous drainage is from the superficial temporal vein and retromandibular veins.

Lymphatic drainage of the pinna is to the preauricular, infra-auricular, and mastoid lymph nodes.[1]

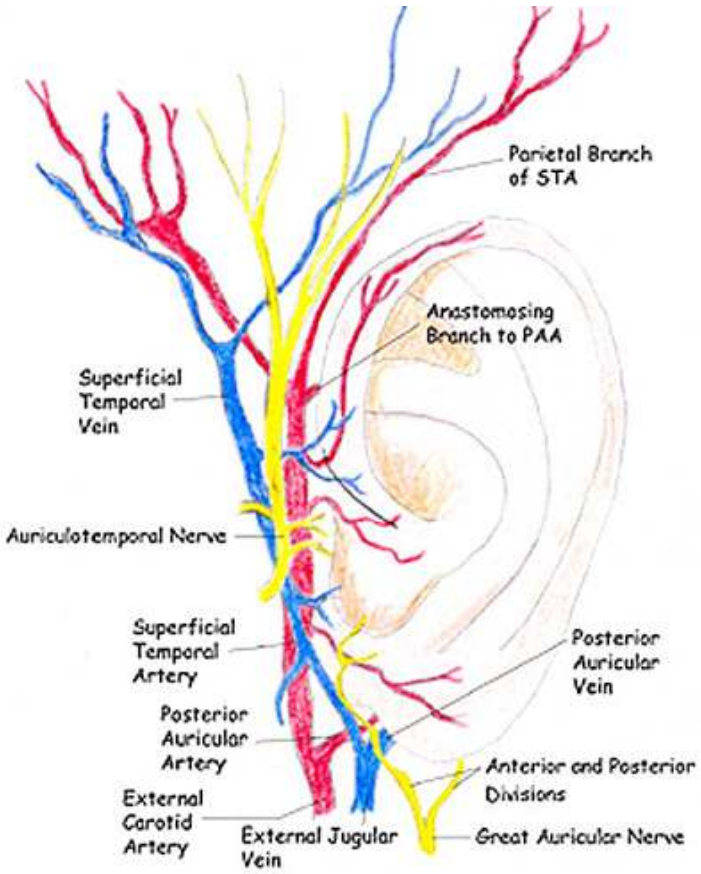
NERVE SUPPLY OF THE EAR

Sensory supply to the auricle is derived from the greater auricular nerve (C2 and C3) , the lesser occipetal nerve (C2 and C3), the

auriculotemporal nerve (V3) , and a branch of the vagus nerve(X; Arnold's nerve) .

The greater auricular nerve(C2 and C3) divides into an anterior and posterior branch , the anterior branch supplies the lower half of the anterior aspect of the ear. The posterior branch supplies a similar area on the posterior surface of the auricle. The superolateral surface of the auricle is supplied by the auriculotemporal nerve. The lesser occipital nerve supplies the superior aspect of the auricle on the posterior side.

The Arnold's nerve supply concha[1]



Blood and nerve supply of the anterior (lateral) surface of the ear

AURICULAR FLAP ANATOMY AND BLOOD SUPPLY

Ear has a unique morphological structure. The lateral surface is densely adherent to the perichondrium and is devoid of subcutaneous tissue, while the medial surface has loosely applied skin containing subcutaneous fat. Lateral skin has the fascia layer between the skin and perichondrium containing subdermal plexus of vessels and is tight, while the medial skin is [1] freely movable, attributed to the loose connective tissue between the perichondrial layer and the skin. It is distinct in that it contains blood vessels and nerve , and it is considered as an extension of the intrinsic auricular muscle layer . Skin flaps of the postauricular region can be viewed as a fasciocutaneous flap.

The postauricular region is a rich source of flap donor site containing skin, loose connective tissue , perichondrium and cartilage. On histologic examination, well-developed vascular channels are seen independently in both the fascial and perichondrial layers of this region. Also ,there are many small vascular channels immediately below the dermal layer, the subdermal plexus. This highly developed vascular network forms an anatomic basis for designing flaps of several different compositions such as fasciocutaneous flaps ,reverse flow fasciocutaneous flap, Postauricular chondrofasciocutaneous flap,Postauricular chondrofascial flap , and additional mastoid fascial flap.[7]

AURICULAR ARCHITECTURE

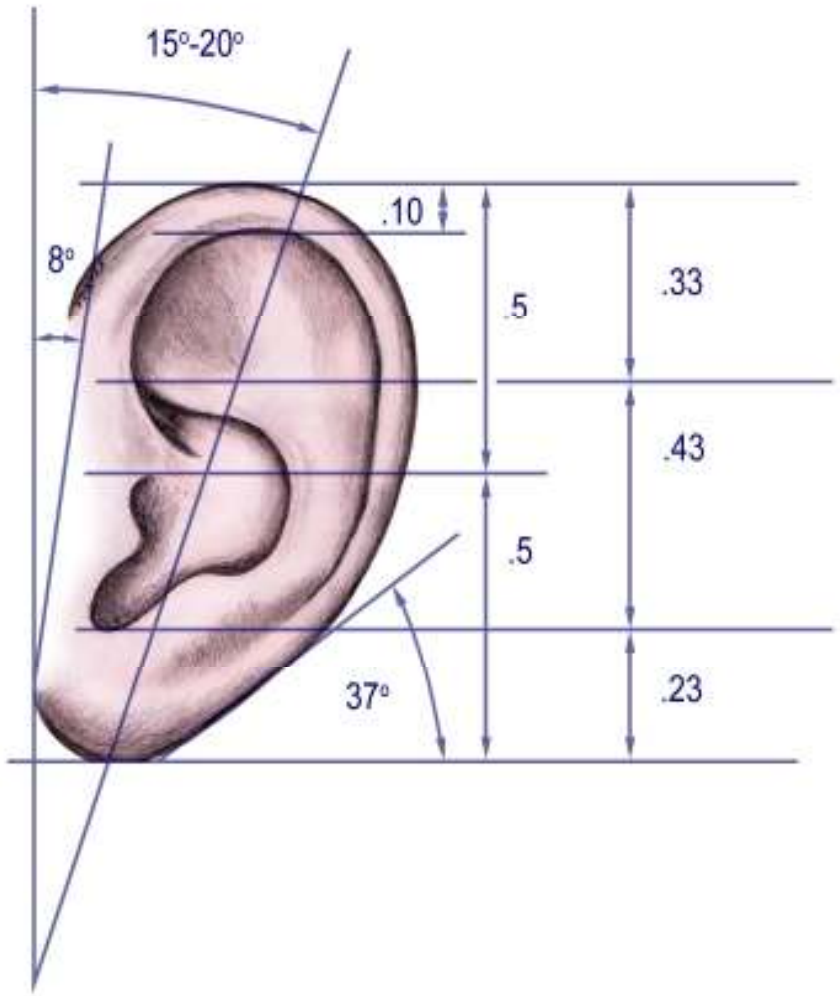
Analysis of the dimensions of the ear and its proportions with the other structures are important for planning reconstructive procedures.[6,8,9] The vertical height of the ear is approximately equal to the distance between the root of the helix at the level of the brow and the lateral orbital rim.

Width of the ear is approximately 55% of its length. The helical rim protrudes from the skull by 1 to 2.5 cm , and the angle of the protrusion averages 25 to 30 degrees. The vertical axis of the ear is inclined posteriorly from the skull at an angle of approximately 15 to 20 degrees [6,10,11] and as originally thought ,not parallel to the dorsum of the nose. [6]

Excessive posterior inclination should be avoided as it gives the ear a low-set appearance. The superior level of the ear should be at the level of the lateral brow. The upper eyelid is used as a landmark, if the patient has brow ptosis.

It is most important to use the opposite side ear as a template, when planning the reconstruction . Because individual variation in topographic features and positioning of the ear is the rule than the exception. The size, orientation and location of the auricle are more important than attention to contour. The necessary contour lines to be

considered while reconstructing the ear, which make an ear recognisable as such are the following: a helix with a root beginning in the concha, concha, a tragus and an antitragus.[6,12]



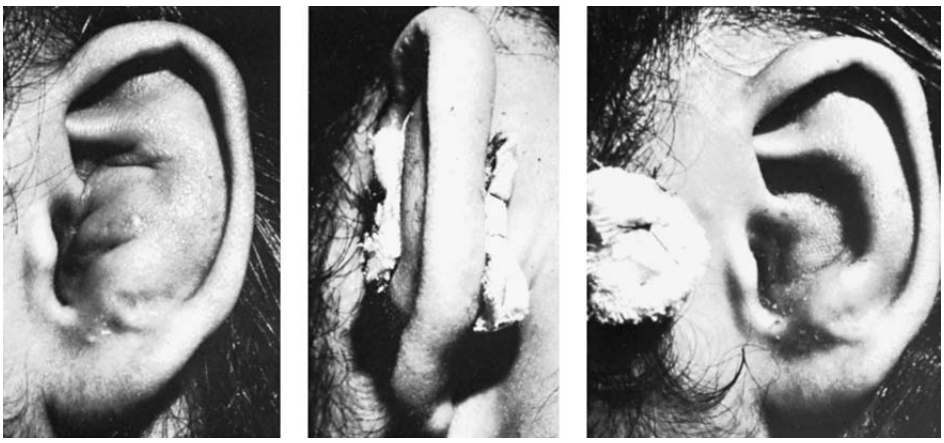
Dimensions and proportions of the external ear

PRINCIPLES OF RECONSTRUCTION OF THE ACQUIRED EAR DEFECTS

Surgeons are frequently called to treat acquired ear defects due to trauma and tumour. Trauma may result in haematoma or laceration of the external ear including meatus. Also, trauma and tumour excision may lead to skin or cartilage loss.

Trauma may be chemical as in thermal injury or physical or it may be mechanical as in human or animal bites ,wrestling, motor vehicle accidents, boxing, brawling, job or sports -related accidents and pierced ears.

If the hematoma is not evacuated, the blood tends to become cartilaginous, and will result in the so-called cauliflower ear. Hematomas may require an incision to fully evacuate or repeated aspirations. Suturing gauze bolsters to the pinna to compress the skin against the cartilage prevents recurrence.



Management of an acute otohematoma. A: Recurrent hematoma of the concha. B: Through and through bolster sutures, after evacuation . C: Appearance of concha after the compression dressing has been removed at 10 days

Lacerations can be simple or complex. Simple lacerations are sutured with 6-0 nylon sutures with exact approximation of the skin edges. When the skin and cartilage are involved (complex), the cartilage edges are approximated and skin to skin repair done.

The skin and cartilage loss can be partial or total. They are treated based on the extent and anatomic location of the defect.[7]

The extent of acquired auricular deformities is divided into

1. Defects of cutaneous cover only,
2. Defects of cutaneous cover and cartilage , and
3. Full-thickness defects in which the medial and lateral skin surface and cartilaginous structure are absent. It can be partial or total loss.

Ideal reconstructive approaches are based on the extent and anatomic location of the defect and an understanding of the differences between anterior and posterior skin surfaces and structurally important versus unimportant cartilaginous zones.

Skin defects of the more pliable posterior surface can often be repaired by direct closure. Anterior cutaneous defects in which cartilage with intact perichondrium are best treated by skin grafts.

When the loss of lateral cutis and supporting cartilage results in a significant change in the shape of the ear, or if there is full thickness loss, reconstructive approaches include either changing the defect into a full thickness wedge shaped defect , or using a composite graft to provide structural support.

Medium-size helical defects , from 1.5 to 2 cm , are usually managed by composite grafts from the opposite ear. Usually , a composite graft about half the size of the defect is harvested from the contralateral ear, thereby creating two ears of equal size.[1]

Many local flaps have been described for repair of full thickness pinna loss.[6,13,14,15,16,17,18]

Ear defects were divided by anatomic location into

1. Conchal bowl and root of the helix ,
2. Defects of the upper third of the auricle ,
3. Defects of the middle third of the auricle , and
4. Defects of the lower third of the auricle.[1]

AURICULAR RECONSTRUCTION BASED ON ANATOMIC LOCATION

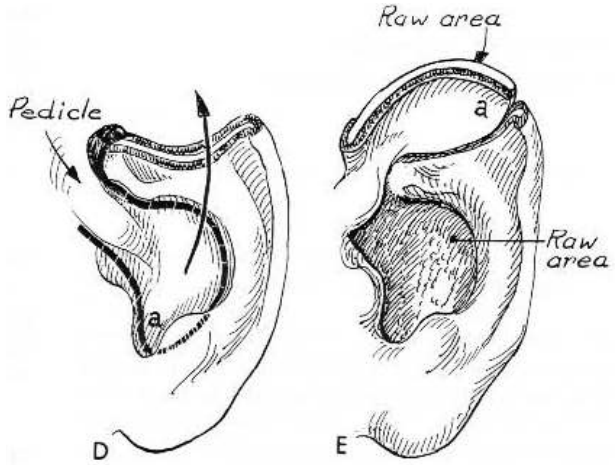
1. DEFECTS OF THE CONCHAL BOWL AND ROOT OF HELIX

Repair in this region is usually successful using skin grafts because grafts provide adequate aesthetic outcome and allow for careful postoperative monitoring of the area , where the defect has resulted from the excision of skin cancer. The retroauricular island transposition flap is very well suited for conchal reconstruction because it is in close proximity to the defect.

Reconstruction of the defects of the root of the helix can be done with the use of a helical advancement flap.[6]

2. DEFECTS OF THE UPPER ONE THIRD OF THE AURICLE

1.Davis conchal chondrocutaneous flap[7,19]

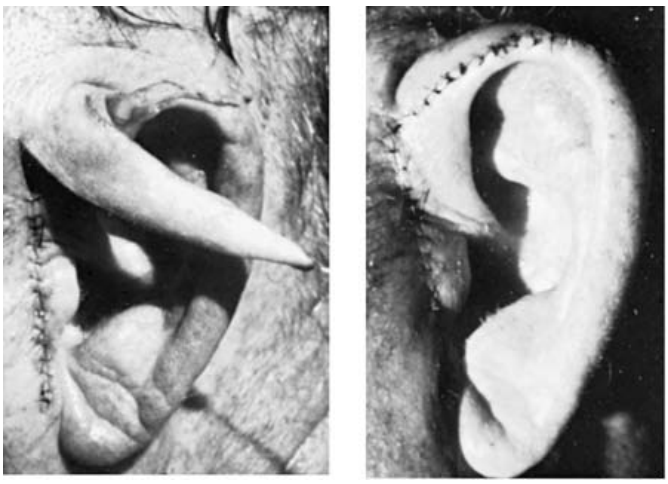


2.Tunnel Procedure of Converse [19]

3. Postauricular flap[20]

4. The combination of a retroauricular flap and conchal cartilage graft.

5. Preauricular flap



The flap is transposed to repair a minor rim defect [21]

6. Helical advancement flap by Antia- Buch[19,22]

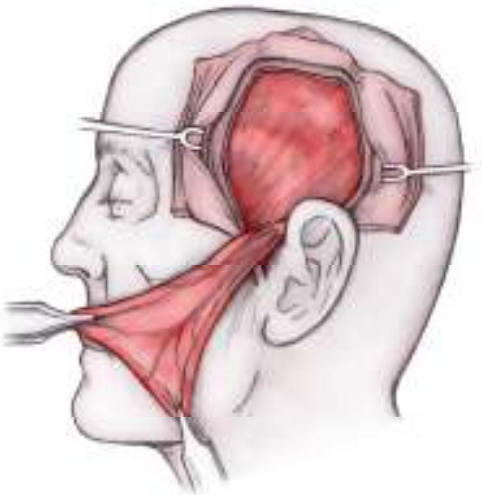
7.Helical reconstruction with a thin caliber tube flap

Large defects of the ear are covered by the use of an autogenous rib cartilaginous framework with temperoparietal fascia and split thickness skin graft coverage.[21]

The temperoparietal fascia layer lies deep to the skin and subcutaneous tissue to which it is firmly attached, measures 2-3 mm in thickness in parietal region, highly vascular, with a rich and consistent blood supply from the superficial temporal artery and vein.

A long vertical incision, about 6 cm is made in the scalp, immediately adjacent and above the auricular defect, exposing the superficially located temperoparietal fascia. The medial plane of flap elevation is over the temporalis muscular fascia in the loose connective tissue. The vascular pedicle is protected after identifying it and anterior limit of the flap is marked by the frontal branch of the facial nerve. The posterior margin of the flap should include the posterior branch of superficial temporal artery and vein. The flap is rotated to 180 degrees in an arc from superior to inferior so that the lateral surface becomes medial surface and gets adherent to the cartilage framework. The edges of the flap are tucked under the edges of the existing skin and flap covered with SSG. Optimal drainage is provided by suction through a closed system.[6]

The important topography to mark on the scalp prior to incision.1. The proximal trunk of the superficial temporal artery, 2.The frontal and parietal branches, 3.The temporal line, and 4.The course of the frontal branch of the facial nerve .



After careful elevation of the flap with protection of the superficial temporal artery pedicle, the flap is draped over the recipient bed. The pliability of the flap make it uniquely suited for draping over cartilage and bone.

3. DEFECTS OF THE MIDDLE ONE THIRD OF THE AURICLE

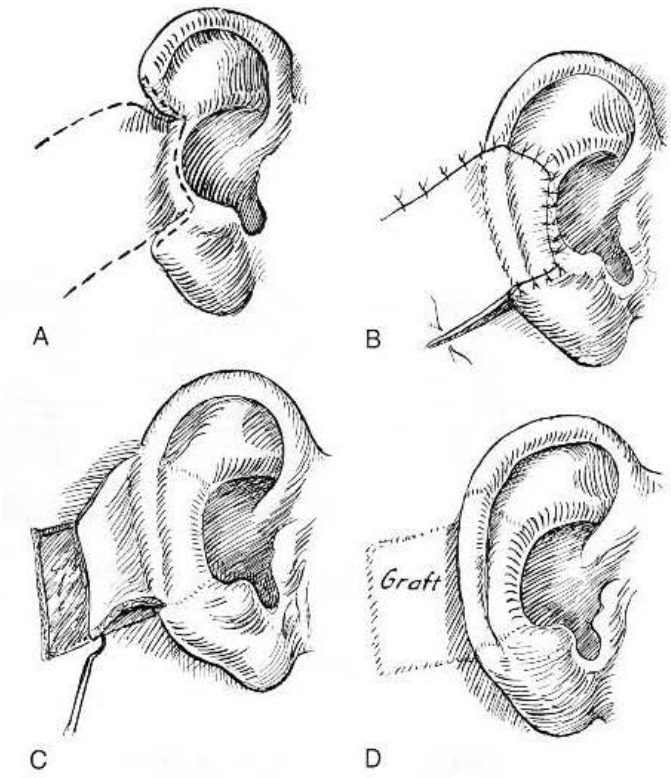
1. Small full thickness defects less than 1.5 cm can be closed by converting the defect into a wedge shaped excision with reduction on vertical height .

2. Full-thickness defects less than 2.5 cm can be reconstructed with Antia -Buch helical chondrocutaneous advancement flaps .

3. Defects that are larger than 2.5 cm in width ,confined to the helical rim can be repaired with a preauricular or postauricular tubed flap.

4. Major defects are repaired using a two stage retroauricular flap without cartilage or as a composite flap to provide non hair bearing soft tissue coverage and cartilage replacement by Dieffenbach flap or Converse tunnel procedure or in single stage by the use of an autogenous cartilaginous framework with temperoparietal fascia flap and split thickness skin graft coverage. There is a better colour match of the retroauricular skin .[23]

1.Dieffenbach's technique



A.The defect and flap outline. B.The flap advanced over the defect.C and D.In a second stage , the base of the flap is divided and the flap is folded around the posteromedial aspect of the auricle. A skin graft covers the scalp donor site.

4.DEFECTS OF THE LOWER ONE THIRD OF THE AURICLE

Lobular tissue permits small advancement flaps to repair helical defects of the lower third of the ear. When reconstructing the entire lower one third of the ear and lobule, cartilage provides the structural support necessary for an aesthetic result.[1]

1.Auriculomastoid flap

A.The earlobe deficiency.B.An Auriculomastoid flap outlined.C.The elevated flap hanging as a curtain from the inferior auricular border.D.The flap folded under and sutured and the mastoid defect closed .A small graft is placed over the auricular donor defect.E.The completed ear lobe.

2. Reconstruction of ear lobe by Zentino Alanis method

3. Two flap technique (Converse)

CARTILAGE GRAFT

Cartilage is obtained from ipsilateral or contralateral concha. The cartilage is obtained by posteromedial or anterolateral approach.[19] Cartilage with perichondrium is removed. The wound is closed primarily and bolster dressing is applied to prevent haematoma in the dead space.

If the defect is more than 25% or more of the helical rim or involve more than two planes, according to rules of Firmin, will require rib cartilage for support.[21] It is harvested from coastal cartilage of 6th and

7th rib. A horizontal incision is made just above the costal margin. The synchondrotic portion of the 6th and 7th ribs is taken with an extraperichondrial dissection to obtain an unmarred specimen. With the help of a template,cartilage fabrication is carried out.[7] Wound is closed after confirming pleural integrity.[24]

AURICULAR KELOID

Keloids of the auricle are a common sequelae of trauma to the lobule in individuals with susceptability. The most common provoking event is ear piercing, but keloids can also arise from a variety of causes,including otoplasty and facelift. A wide variety of procedures have been used in the management of keloids, like lasers, injection of interferon,simple intralesional excision and steroid injections. **Vito Quatela and Mack L.Cheney** recommend treatment with intralesional injections of kenalog 40 first (triamcinolone acetonide suspension 40 mg/ml) given 2 weeks apart for a total of four to five sessions.[25] The effect of the injection is evaluated every 2 weeks, and when softening of the tissue is noted,surgical resection is planned. An atraumatic surgical excision within the margins of the keloid lesion is performed followed by an intraoperative intralesional injection of kenalog 40. Postoperatively, the patient is followed up carefully for any evidence of recurrence.[6]Corticosteroid injections combined with surgery show a

recurrence rate of 0% to 100%.[7]If there is evidence of keloid formation in the postoperative period, Kenalog 40 injections is restarted. Low dose radiation therapy is reserved for intractable keloid formation.[6, 26]

Complications

1.Infections and chondritis, hematomas , keloid formation, suture complications, pain, partial skin loss, pressure necrosis ,color mismatch and venous congestion of flaps .[3]

Materials and Methos

MATERIALS AND METHODS

The study was conducted in Coimbatore Medical College Hospital during the period from June 2011 and January 2013.

This is a non randomised descriptive prospective study.

Selection of patients

Inclusion criteria

1. All acute and delayed presentation of acquired ear defect patients attending Plastic Surgery OPD by themselves or being referred from trauma ward or other specialities in Coimbatore Medical College hospital were the source of cases for the project.
2. Cases of age group where they will be able to make an assessment outcome by themselves were included.

Exclusion criteria

1. Patients who were mentally subnormal , who cannot make an assessment of their management outcome were excluded.

Clinical assessment

History of the injured

On first consultation name, age and sex recorded in the patients' with acquired ear deformity. History of mode of injury, duration , pain, pus discharge and previous treatment received were recorded.

History of smoking, diabetes mellitus, hypertension, bronchial asthma and epilepsy were enquired and recorded.

Physical examination

Laterality of the injury, segment of the ear involved, whether it is partial thickness or full thickness ,were also recorded .

Measurement of both the ears including height ,width and conchomastoid angle and defect size were made. Donor site for flap and cartilage were assessed for scarring, associated injury , infection and adequacy.

Investigations

Haemoglobin ,Blood Sugar ,Blood Urea, Serum Creatinine ,Chest X-Ray, ECG and Wound swab for culture & sensitivity were done.

Preoperative planning

Template of the normal ear, affected ear and the defect were made using X-Ray film. Planning was done for reconstruction taking into consideration the defect size, site, extent of injury and availability and adequacy of donor site and was done in the presence of the Professor and Assistant Professors including the Guide.

Preoperative treatment

In patients with infection, antibiotics were started based on the wound swab culture and sensitivity report. Smokers were advised to stop smoking. Diabetics and hypertensives were brought under control before surgery. Necessary precautions were taken for patients with bronchial asthma and epilepsy, especially if the procedure is planned under general anaesthesia.

In patients with keloids, six doses of intralesional triamcinolone of 10-40 mg were given at 4 weeks interval and then subjected for surgery

Preoperative counselling

Patients were explained in detail about the planned procedure, need for multiple stages, flap revision, scar revision, donor site morbidity, complications and expected outcome. Patient's expectations were also recorded and considered during selection of the reconstructive option.

Patients were also explained about the need for regular postoperative follow up and care. Patients with keloids were told about the need for postoperative triamcinolone injections and the chance of recurrence and in that case need for local irradiation.

Informed consent was obtained from the patients above the age of eighteen and from their parents for those patients less than 18 years of age group.

Preoperative digital photography

Digital photography of the patient's face including the whole of both ear in anterior view, lateral views and posterior view taken.

Anaesthesia

Most of the major first stage procedures were done under general anaesthesia, whereas minor procedures like flap division and inset and flap revision were done under local anaesthesia.

Surgical procedures

Defects involving upper third

Out of 2 cases, one case was full thickness defect of upper third of the ear. Davis conchal chondrocutaneous flap was done with mastoid flap for skin cover over the posterior surface of the flap for that case. The flap donor site was covered with SSG from the scalp. There was flap tip necrosis, it was debrided and covered with SSG.

Case:18: Davies conchal chondrocutaneous flap

In another patient temperoparietal fascia flap was used to cover the exposed cartilage without perichondrium on medial and lateral aspect of the upper third of the ear and the flap covered with SSG. There was contracture of the helix, the same was released and covered with SSG.

Case :03 – Temperoparietal fascia flap with SSG cover

Defects involving middle third

Out of 5 cases ,3 cases were full thickness defect involving helix and antihelix. All three cases underwent contralateral conchal cartilage graft with Dieffenbach technique of flap cover.

Case :14 – Dieffenbach Technique: right ear

Case : 13 – Dieffenbach Technique: left ear

One case was complex laceration extending to the postauricular region and adjacent scalp. Wound debridement and skin to skin repair done after approximating the cartilage.

Case: 20 – Complex laceration- Skin to skin repair done

One another case was exposed cartilage devoid of perichondrium of size 1.5x1.0 cm over the lateral aspect of helix and antihelix. The local flap utilising the laxity of skin over the medial aspect of the ear was mobilised and the cartilage was covered. Donor site closed primarily

Case 05 –Local transposition flap

Defects involving lower third

Out of 3 cases, one was full thickness defect of lower third of the ear. Superiorly based postauricular flap with SSG for donor site was done.

Case 16: Superiorly based retroauricular flap

For the case of total loss of lower third of ear, inferiorly based cervical flap from nape of neck with SSG for donor site was done.

Case 02: Inferiorly based cervical flap

Another case of lobule loss was managed with auriculomastoid flap. There was donor site keloid. It was managed with 6 doses of triamcinolone at 3 weekly interval.

Case 01: Auriculomastoid flap

Defects of the upper and middle third

Out of 3 cases , one complex laceration was debrided and skin to skin repair done.

Case 17: Complex laceration- Skin to skin repair done

One case of complete loss of upper and middle third underwent coastal cartilage graft with temperoparietal fascia flap with SSG cover. Another case of full thickness defect of helix and antihelix underwent postauricular flap cover with SSG for donor site.

Defects of middle and inferior third

Out of 3 cases, one case of complete loss of middle and lower third underwent coastal cartilage implant with preauricular flap. There was flap tip necrosis and delayed transverse cervical tubed flap was done in stages after debriding the necrosed tip.

Case 04: Coastal cartilage graft with preauricular and Transverse cervical tubed flap

Another case of full thickness defect of helix and antihelix underwent retroauricular flap with SSG for donor site.

Case 12: Retroauricular flap

The third case of keloid of the helical border of the middle and inferior third of the ear and of the inferior border of the lobule was excised intralesionally and skin closure done primarily. One dose of injection triamcinolone injected peroperatively.

Case 06 – Keloid - Injection triamcinolone given and intralesional excision done

Defects of the upper,middle and lower third

Out of 4 cases ,one case had preserved lobule. Coastal cartilage graft with temperoparietal fascia flap with SSG cover was done. There was necrosis of the inferior end of the flap. It was debrided and superiorly based postauricular flap was done.

Case 15: Coastal cartilage graft with temperoparietal fascia with SSG

Another case of full thickness defect of helix and part of antihelix was reconstructed using a retroauricular flap in stages. There was flap tip necrosis at the superior end. It was debrided and flap was revised to correct the defect.

Case 09-Retroauricularflap

Another case was a post burn deformity with curling in of the whole of the helix. It was unfurled by two incisions, one at the root of the helix and other at the lobule. The created defect was closed by V-Y advancement at the root of the helix and preauricular flap at the lobule.

Case 07: Preauricular flap with V-Y advancement flap

Fourth case was a complex laceration of the antihelix of the whole of the ear, sutured skin to skin using 5-0 prolene.

Case 10: Complex laceration- Skin to skin repair done

All flaps planned already were planned in reverse using the template again during surgery. Preoperative digital photographs were taken .

Flap donor defects were closed primarily or split skin grafting was done. Cartilage donor site from contralateral ear was closed primarily and bolster dressing was applied. The coastal cartilage donor site was closed after confirming pleural integrity. Drain tube was used in selective cases.

Flap division was done after 3 weeks and inset completed. Any residual donor defect is also closed primarily or with split skin grafting.

Flap revision if needed was considered after 3 months.

Postoperative course

Injectable or oral cephalosporins were given for 5 days in uninfected cases and prolonged as required in culture proven infected cases.

1st dressing was done on 4th POD and drain tubes were removed if no soakage. Donor dressings were also changed.

Patients were discharged on 5th POD if the flap was viable and no infection in the donor or recipient site. Patient was reviewed on 8th to 10th POD for change of dressing and suture removal.

Flap division was done after 3 weeks and inset completed simultaneously. In few cases flap was delayed for a period of one week before insetting.

Postoperative instructions to the patient

To not to lie on the operated side. Cleaning of the external auditory canal and post auricular sulcus with ear buds. To avoid sun exposure to prevent hyperpigmentation of the scar and donor site scar massaging.

Patient's with keloid were advised to come back for follow up every month for 6 months to rule out recurrence .

Postoperative digital photographs were taken.

Follow up

After completion of the surgery, patient was reviewed every month. Was examined for nature of scar, hyperpigmentation, keloid formation of the donor and recipient site scar, flap bulkiness and irregularity.

Size match,Colour match, symmetry and contour match with opposite ear was analysed.

Outcome analysis in subjective and objective terms were recorded considering the above criteria, once the treatment is completed.

It was done by the **Excellence Scale:** This is also a 5-point scale, asking the respondent to evaluate performance against their definition of the words that name the points. The named points are:

- Excellent (5)
- Good (4)
- Fair (3)
- Poor (2)
- Unacceptable (1)

Subject was patient in all our cases. Objective analysis was done individually by our Professor, guide and myself and all three scores were added together.

Digital photographs were taken at the end of the treatment.

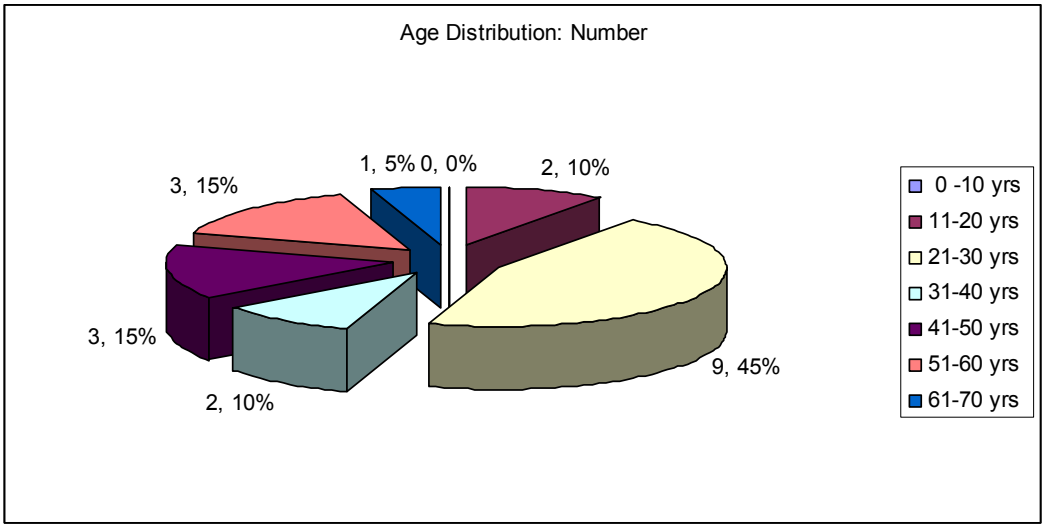
Observations and Results

OBSERVATIONS AND RESULTS

A total of 20 cases of acquired ear defects were studied.

Table:01 -Age Distribution

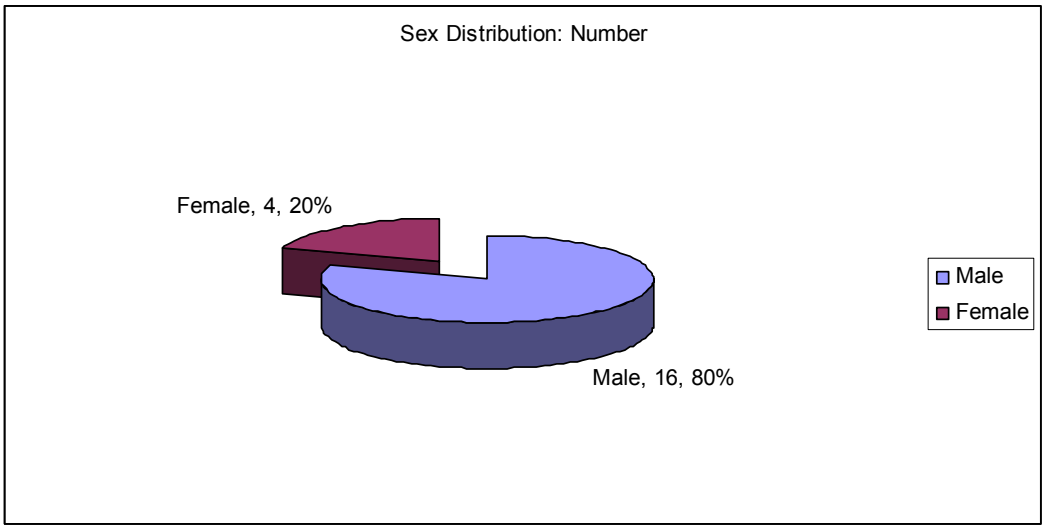
Age	Number	Percentage
0 -10 yrs	0	0
11-20 yrs	2	10
21-30 yrs	9	45
31-40 yrs	2	10
41-50 yrs	3	15
51-60 yrs	3	15
61-70 yrs	1	5



The commonest age group with acquired ear deformity in our study was 21-30 yrs.

Table 02 - Sex Distribution

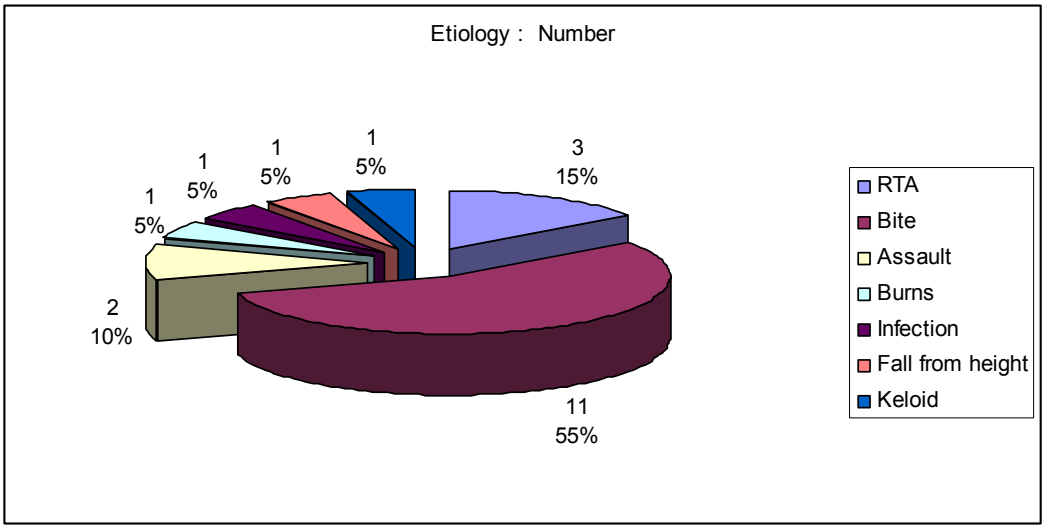
Sex	Number	Percentage
Male	16	80
Female	04	20



Acquired ear defect was more common in male(80%) in our study.

Table 03 – Etiology

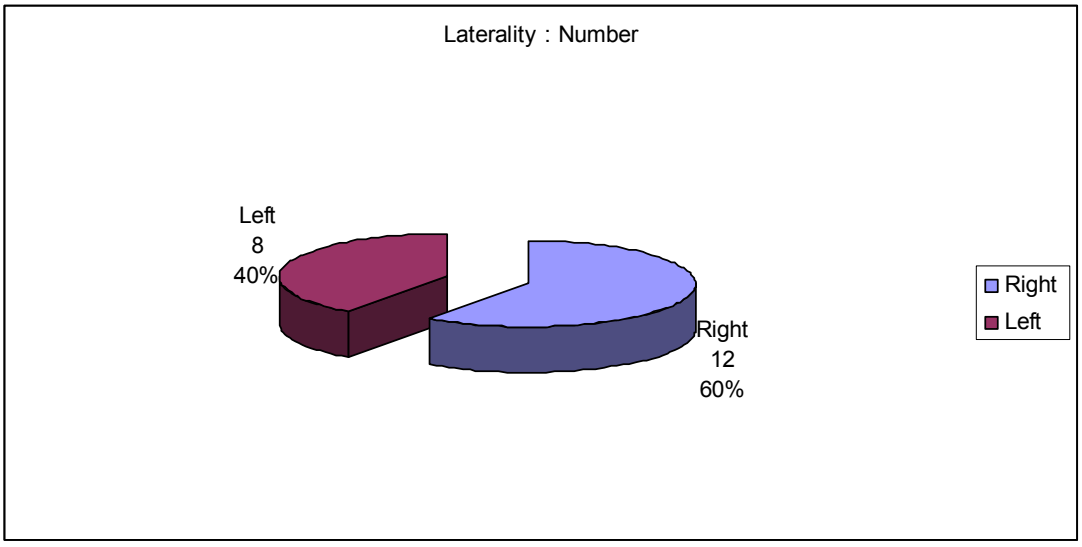
Mode of injury	Number	Percentage
RTA	3	15
Bite	11	55
Assault	2	10
Burns	1	5
Infection	1	5
Fall from height	1	5
Keloid	1	5



The commonest mode of injury was bite(55%),followed by road traffic accident (15%)

Table 04 - Laterality

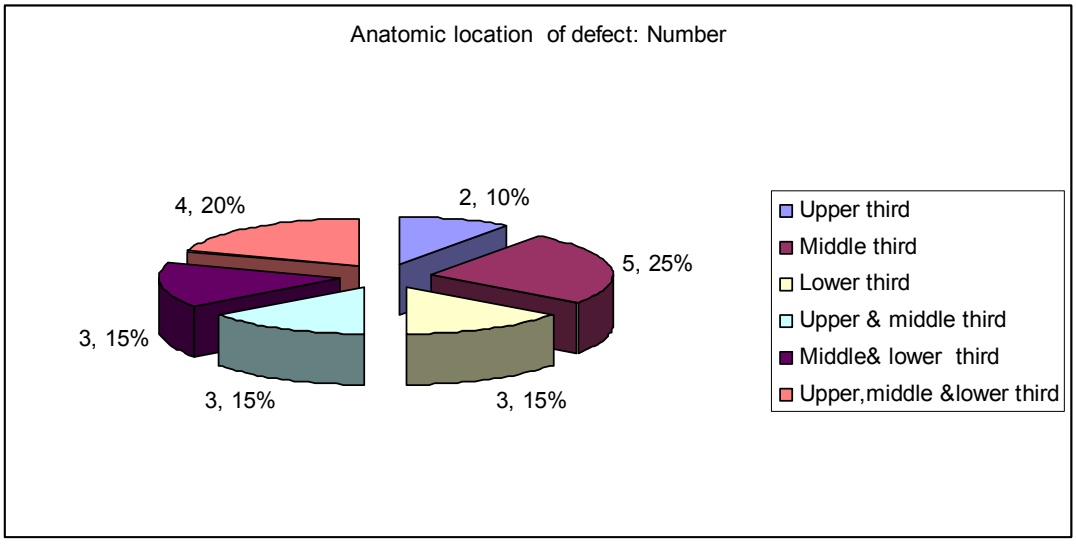
Laterality	Number	Percentage
Right	12	60
Left	08	40



Right ear was injured in 12 (60%) patients whereas left ear was injured in 8(40%) patients only

Table 05 - Anatomic location of defect

Location	Number	Percentage
Upper third	2	10
Middle third	5	25
Lower third	3	15
Upper & middle third	3	15
Middle& lower third	3	15
Upper, middle &lower third	4	20



In our study group middle third ear defect was common followed by the defect involving upper, middle and lower third together , because middle third is the more protruding part of the ear and hence prone for injury.

Table 06-Extent of defect

Extent	Number	Percentage
Cutaneous cover only	2	10
Cutaneous cover and cartilage	5	25
Full thickness	13	65

Full thickness defect was common in our study group involving 65% of the patients.

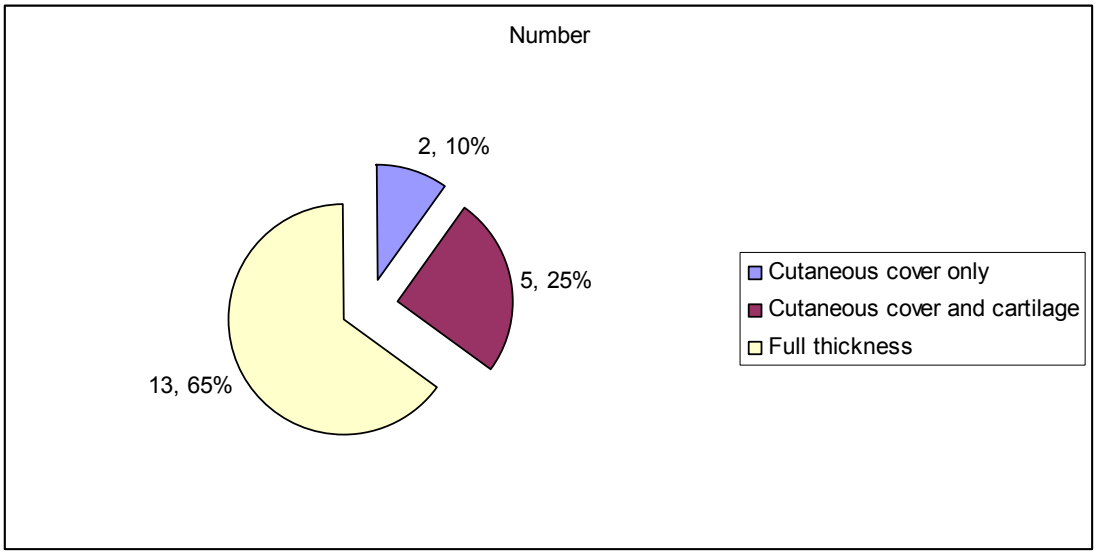


Table 07-Risk factors

Illness	Number of patients	Percentage
Smoking	5	25
Diabetes mellitus	1	5
Hypertension	1	5
No risk factors	13	65

Smoking was the commonest risk factor in our patients, present in 25% of our patients.

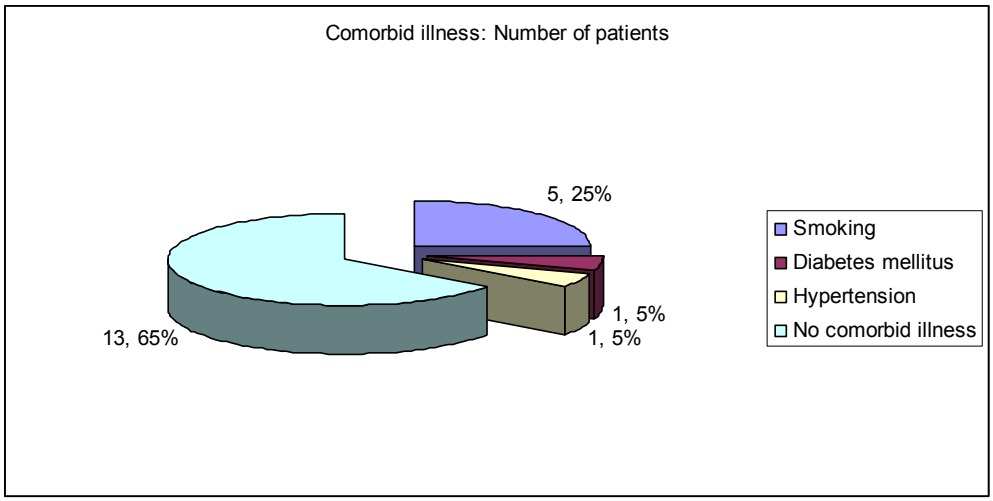


Table 08-Type of surgery

Surgery	Number of patients	Percentage
Skin to skin repair	3	15
Full thickness excision and primary suturing	1	5
Cutaneous flap	8	40
Composite flap	8	40
Conchal cartilage	3	15
Coastal cartilage	3	15

The commonly performed surgeries were cutaneous and composite flap each 40%.

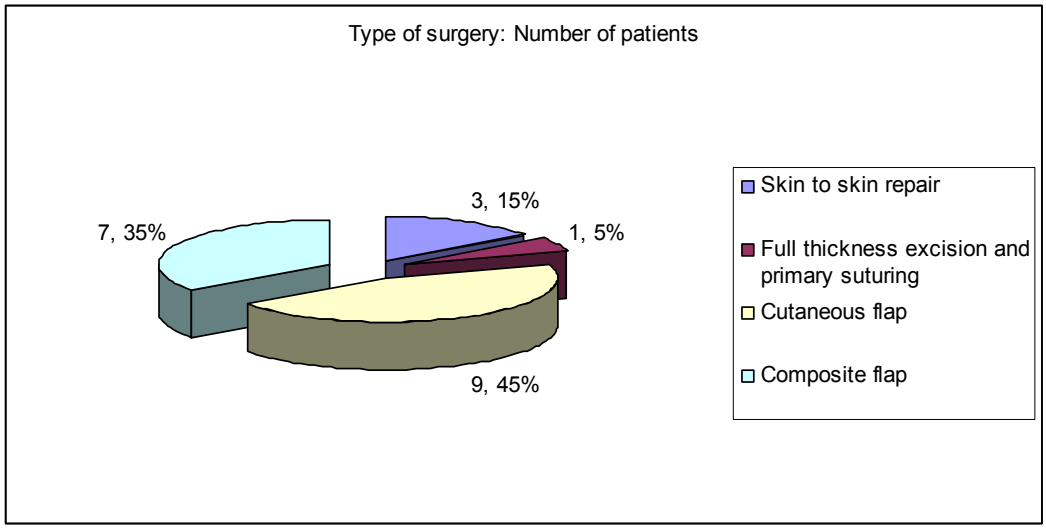
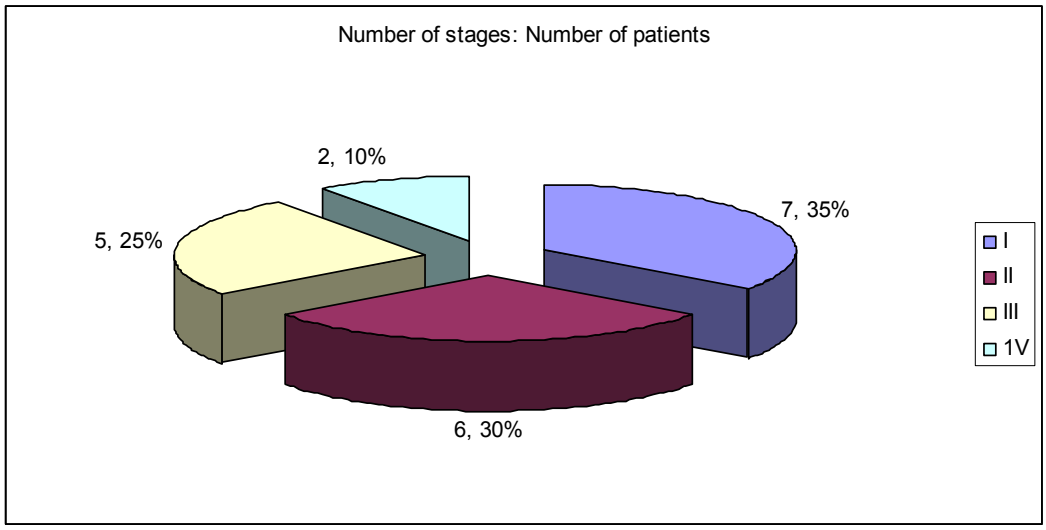


Table :09-Number of stages

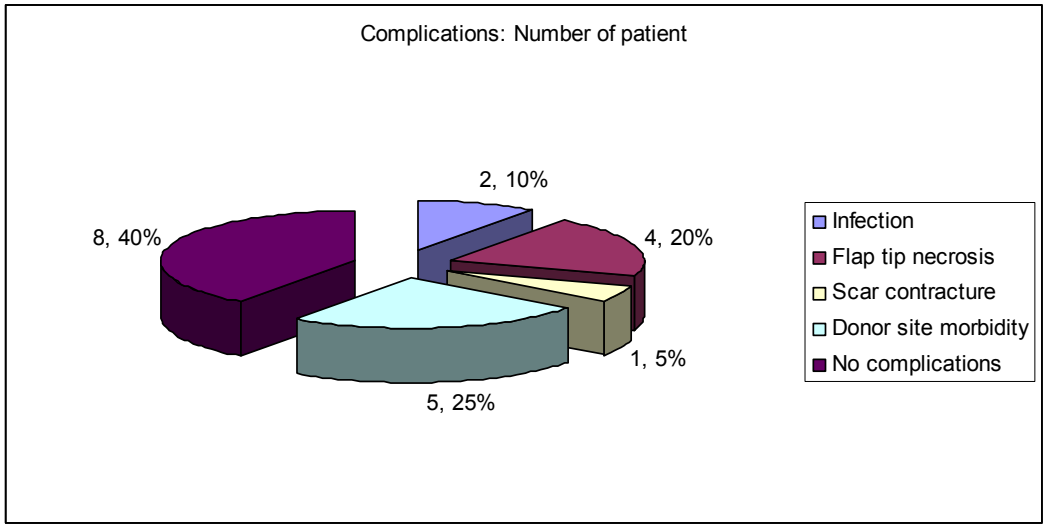
Stages	Number of patients	Percentage
I	7	35
II	6	30
III	5	25
1V	2	10



In our study group 7 patients had single stage surgery(35%), next being two stage surgery in 6 patients which constitute 30% .

Table 10-Complications

Complication	Number of patient	Percentage
Infection	2	10
Flap tip necrosis	4	20
Scar contracture	1	5
Donor site morbidity	5	25
No complications	8	40



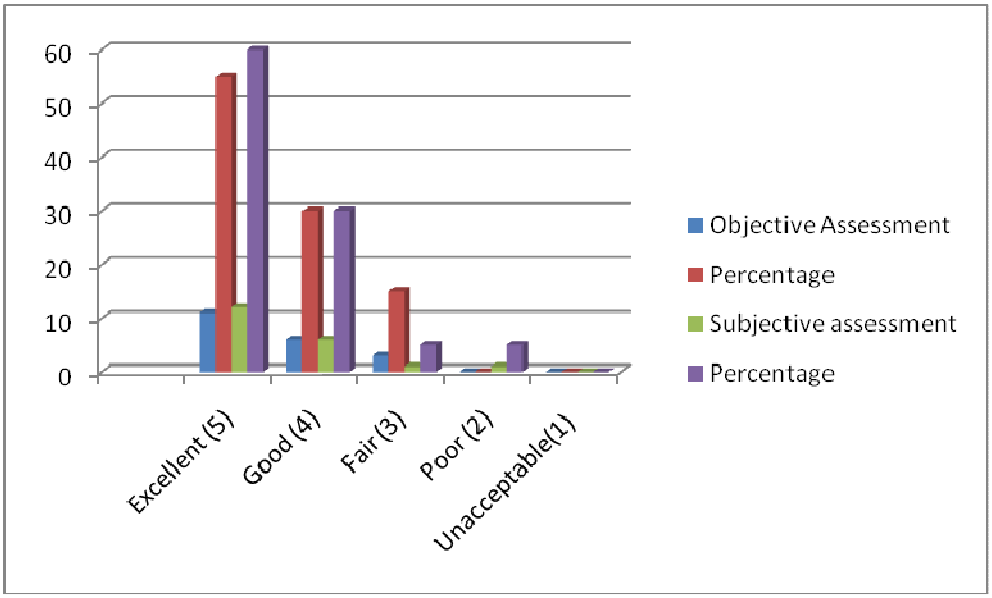
Donor site morbidity was the commonest complication in our study group constituting 25% of the patients.

OUTCOME ANALYSIS

1.Contour

Table 11

Score	Objective assessment	Percentage	Subjective assessment	Percentage
Excellent (5)	10	50	6	30
Good (4)	4	20	5	25
Fair (3)	2	10	6	30
Poor (2)	3	15	2	10
Unacceptable(1)	1	5	1	5

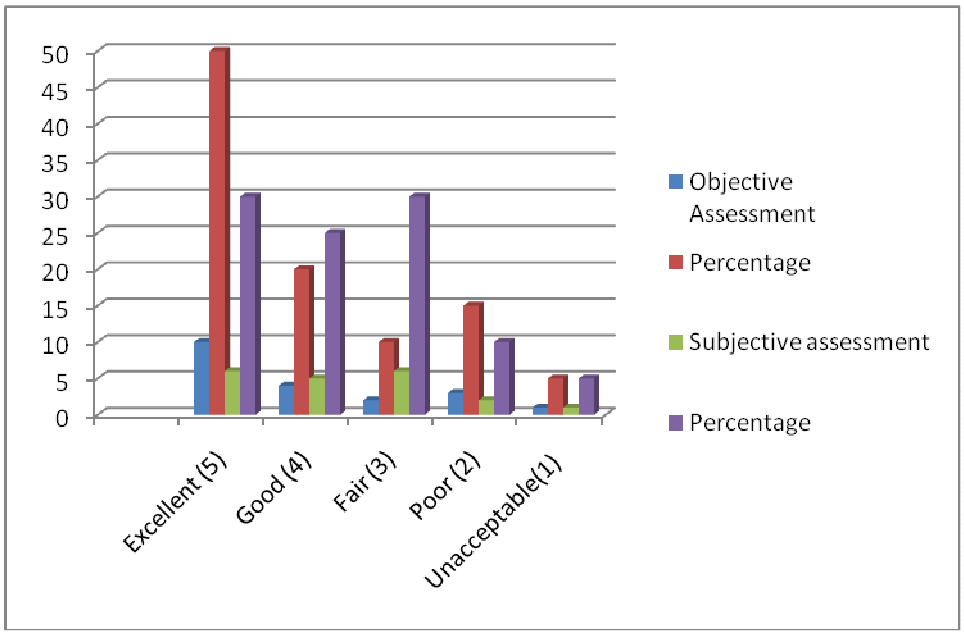


Fifty percent of the patients were fully satisfied with the contour, but we were satisfied with the contour of only 30 % of the cases. According to us another 30% of the patient had only fair contour.

2.Colour match

Table 12

Score	Objective assessment	Percentage	Subjective assessment	Percentage
Excellent (5)	11	55	12	60
Good (4)	6	30	6	30
Fair (3)	3	15	1	5
Poor (2)	-	-	1	5
Unacceptable(1)	-	-	-	-

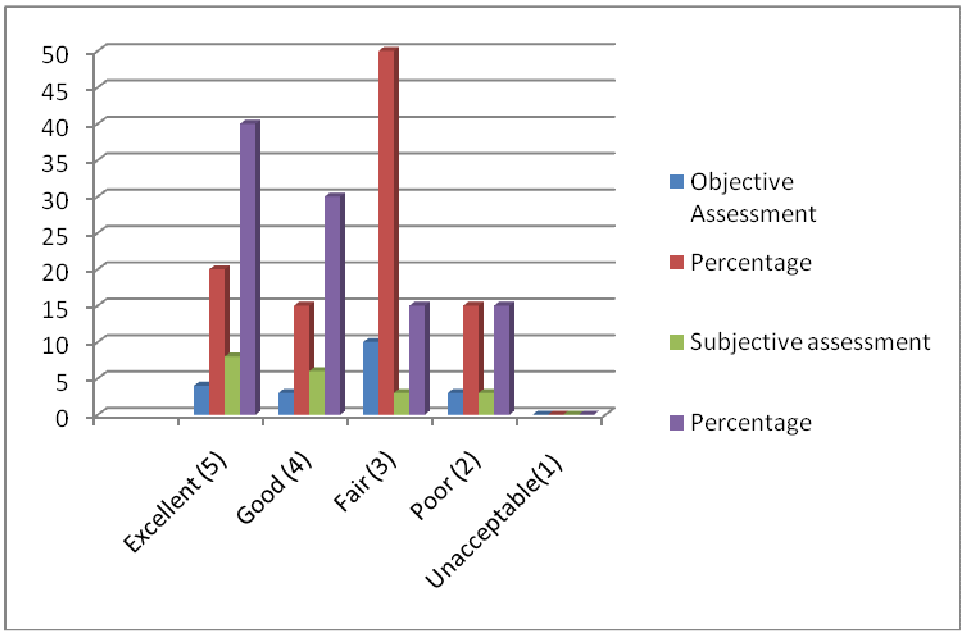


Colour match was satisfactory for 55% of the patients and in 60 % of the patients for the surgeons. Another 30% was good according to the patient and the surgeons'.

3.Bulkiness

Table 13

Score	Objective assessment	Percentage	Subjective assessment	Percentage
Excellent (5)	4	20	8	40
Good (4)	3	15	6	30
Fair (3)	10	50	3	15
Poor (2)	3	15	3	15
Unacceptable(1)	-	-	-	-

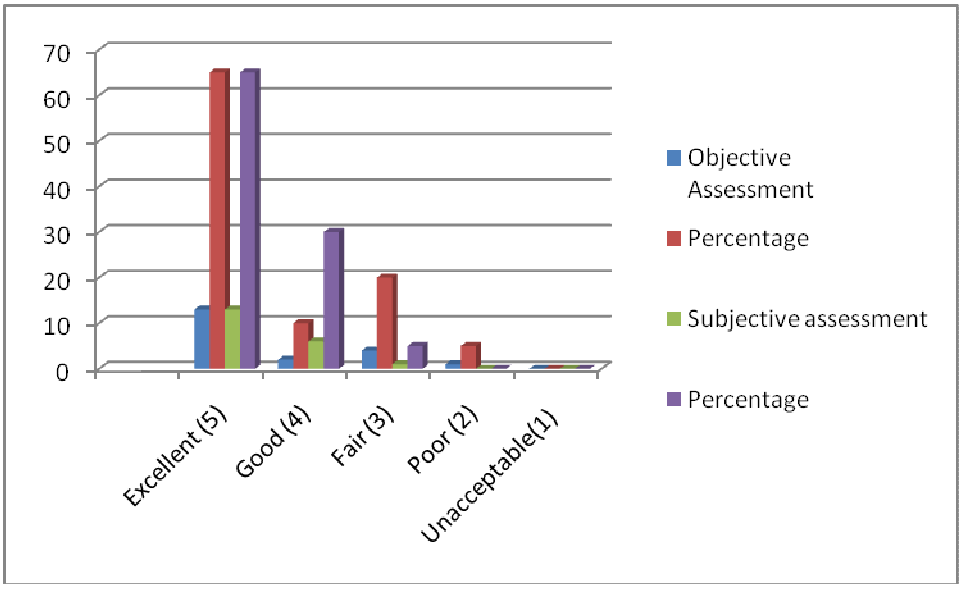


Only 20% of the patients were satisfied with the bulkiness of the flap, whereas 50% of them have scored them as fair only. On analysis by the surgeons 40% of the patients had fully acceptable bulkiness and another 30% had been score as good.

4.Stages

Table 14

Score	Objective assessment	Percentage	Subjective assessment	Percentage
Excellent (5)	13	65	13	65
Good (4)	2	10	6	30
Fair (3)	4	20	1	5
Poor (2)	1	5	-	-
Unacceptable(1)	-	-	-	-

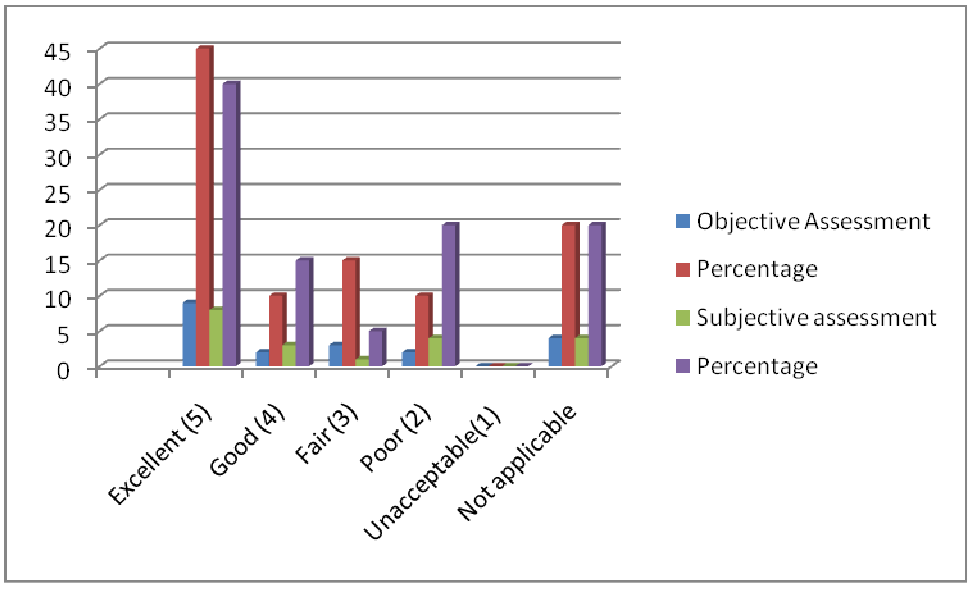


In 65% of the patients the number of stages of surgery were acceptable by both patient and the surgeons.

5.Donor site

Table 15

Score	Objective assessment	Percentage	Subjective assessment	Percentage
Excellent (5)	9	45	8	40
Good (4)	2	10	3	15
Fair (3)	3	15	1	5
Poor (2)	2	10	4	20
Unacceptable(1)	-	-	-	-
Not applicable	4	20	4	20

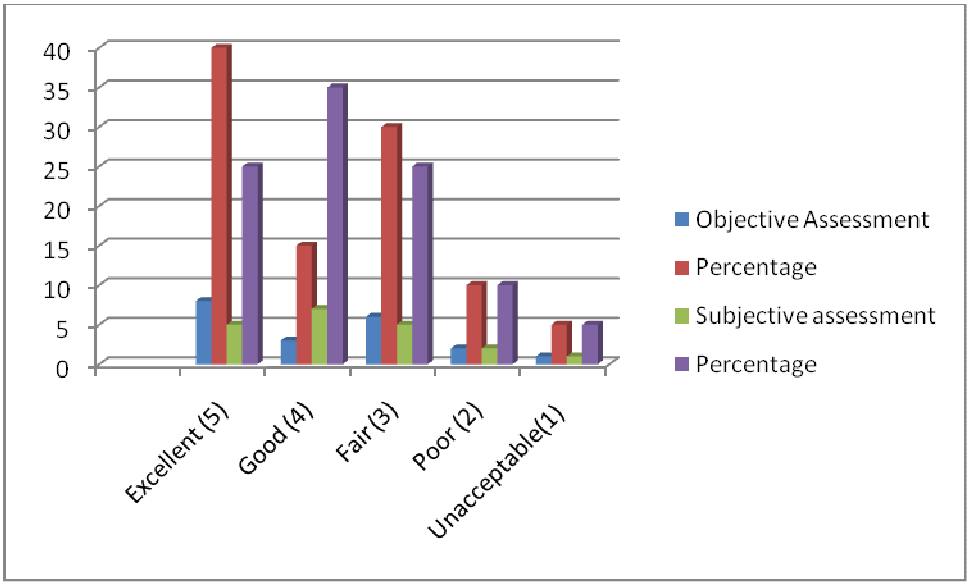


Forty five percent of the patients were satisfied with the donor site, whereas surgeons were fully satisfied with only 40% of the patients' donor site.

6.Overall satisfaction

Table 16

Score	Objective assessment	Percentage	Subjective assessment	Percentage
Excellent (5)	8	40	5	25
Good (4)	3	15	7	35
Fair (3)	6	30	5	25
Poor (2)	2	10	2	10
Unacceptable(1)	1	5	1	5



Forty percent of the patients scored overall outcome as excellent whereas surgeons were fully satisfied with the outcome of only 25% of the patients.

Discussion

DISCUSSION

Management outcome of acquired ear defects is analysed on the basis of the aesthesis that is achieved finally. The factors considered for that were colour match of the reconstructed part of the ear with the adjacent skin, contour of the ear, bulkiness of the reconstructed part, donor site, number of stages of surgery and overall satisfaction. The analysis was done subjectively by the patient and objectively by the Professor, Guide and myself and put together to get the average. Both analysis were compared and patient and surgeons' perspective of the outcome is obtained.

In our study over a period of 22 months, the above said aesthetic factors were analysed.

Analysis of the results

Incidence

Of the 20 patients studied males were commonly affected(80%). The commonest age group affected being 21-30 years(45%). The predominant cause being bites by human and dog(55%).

Clinical Features

Right side was commonly involved (60%). The common anatomic location affected was middle third of the ear(25%). Full thickness defect was predominant in our study group(65%).

Smoking was the commonest risk factor.

Retroauricular flap was the commonest surgery performed in our study group(20%), followed by skin to skin repair, Dieffenbach technique and temperoparietal fascia flap, each being 15%.

In our study group 7 patients had single stage surgery(35%), next being two stage surgery in 6 patients, constituting 30%

OUTCOME ANALYSIS

Fifty percent of the patients were fully satisfied with the contour, but we were satisfied with the contour of only 30% of the cases. According to us another 30% of the patient had only fair contour .

Colour match was satisfactory for 55% of the patients and in 60 % of the patients for the surgeons. Another 30% was good according to the patient and the surgeons.

Only 20% of the patients were satisfied with the bulkiness of the flap, whereas 50% of them have scored them as fair only. On analysis by the surgeons, 40% of the patients had fully acceptable bulkiness and another 30% had been scored as good.

In 65% of the patients, the number of stages of surgery were acceptable by both patient and the surgeons.

Forty five percent of the patients were satisfied with the donor site, whereas surgeons are fully satisfied with only 40% of the patients' donor site.

Forty percent of the patients scored overall outcome as excellent whereas surgeons were satisfied fully with the outcome of only 25% of the patients.

On analysing the outcome by the patient and the surgeons, a protocol can be formed in choosing a particular management for the acquired ear defects and it will point the deficiencies in the management which can be rectified in the future. This will also help us to improve the already evolving management techniques.

Nabil I.Elsahy uses the medial surface skin of the ear because it is pliable.[7] **Chang YL, et al** consider poor ear definition as major drawback in retroauricular flap[27]. In our study also subjective assessment score of contour is only 30% as excellent and another 30% is only fair. This is because 20% of our patients had undergone retroauricular flap and hence we have obtained only fair ear definition in majority of our patients. Whereas in objective assessment 50% of the patients have felt that contour is excellent and another 20% as good. This difference of opinion indicate that patients are less concerned than the surgeons about the contour outcome.

According to **Paul.S.Gill, Rafi S.Bidros and Sean Boutros,** local flaps will give the most natural appearing ear with perfect match of skin quality.[22]According to **Nabil I.Elsahy**,[7] the retroauricular skin provides satisfactory colour match. **Vito Quatela** and **Mack L.Cheney** found that the temperoparietal fascia flap can accept split skin or full thickness graft with good colour match. In our study colour match was considered to be excellent in 55% of the patients and another 30% as good. Surgeons also felt that it was excellent in 60% of the patients and good in another 30%. This was because majority of our patients underwent local and retroauricular flaps.

Converse JM,Brent B and **Songehroen I,et al** favoured retroauricular flap because of its sufficient bulkiness.[28,29] **Nabil I.Elsahy**,[7]uses flap from the medial surface of the ear because the skin is thin. On objective assessment, only 20% of the patients were completely satisfied with bulkiness of the flap,whereas 50% of them commented it as fair. But on subjective assessement ,40% of the patients had completely acceptable bulkiness and another 30% patients had good bulkiness. This shows that majority of the patients want thin flap and more concerned about the bulkiness of the flap,whereas surgeons thought that the flap bulkiness will decrease over a period of time as the edema settles and majority of the cases had thin retroauricular flap only.

According to **Nabil I.Elsahy**, [7] the advantage of preauricular flap is,it is one-stage operation, and retroauricular flap based posteriorly on the mastoid scalp as two stage operation. In 65% of the patients the number of stages of surgery were acceptable by both Patient and the Surgeons. Another 10% and 30% were considered good by the patient and the surgeons respectively. This is because complex lacerations , keloid excision ,preauricular flap, conchal chondrocutaneous flap and temperoparietal fascia flap needed only one stage surgery, which constituted majority of our patients.

According to **Nabil I.Elsahy**, [7] the donor defect of retroauricular flap will be hidden behind the ear. Also, the preauricular flap donor site lies in the face-lift incision which will not be obvious . The donor site scar of temperoparietal fascia flap can be hidden within the hair. Fourty five percent of the patients were satisfied with the donor site completely, whereas surgeons were fully satisfied with only 40% of the patients donor site. This is because the skin grafted donor site in 10 % of the patients were uneven and hyperpigmented. 5% of the patients developed keloid over the donor site which settled with Injection triamcinolone.

Forty percent of the patients scored overall outcome as excellent whereas surgeons were fully satisfied with the outcome of only 25% of the patients. This difference is because patients were not much concerned

about the contour but worried about the bulkiness of the flap. Fifteen percent of the patients scored their overall outcome as good and Thirty percent scored as fair. Surgeons scored 35% of the patients as good and 25% as fair as these patients had donor site morbidity and needed more than two stages of reconstruction. According to the patients as well as the surgeons, 10 % had poor results attributed by patients to bulky flap and by surgeons to poor contour . Both Patient and the surgeons considered in 5% patients as unacceptable result. This is because 5% of the patients had contracted reconstructed ear.

Thus this study shows the significance of analysing the outcome of the management of acquired ear defects by both the patient and the surgeon which will help us to improve our techniques and to give satisfactory results.

From our study we found that, patient is not much concerned about the fine contour of the reconstructed ear or about the colour match with the adjacent skin but expects a thin, pliable ear. Wanted surgeries to be completed in one or two stages and hidden donor site with donor site scar that is not obvious.

Also reconstructive surgeons like to achieve near normal contour with contralateral ear with good colour match and sufficiently bulky flap

only. He too wanted to finish reconstruction with less number of stages with very minimal donor site morbidity.

The pitfall in our study was lack of comparison between different procedures for similar defect. This can be attributed to less number of cases received due to brief study period.

Conclusion

CONCLUSION

In our study conducted over a period of 22 months, we treated 20 patients with acquired ear defects.

After analysis of the outcome by the patient and the surgeons we have come to a conclusion that inspite of the varied anatomical location and extent of the defect, and whatever procedure is performed while reconstructing ear, thin, pliable flaps with good contour and colour match should be chosen and it should be completed in one or two stages, giving equal priority for the donor site scar as for the ear. This outcome can give satisfaction for both patient and the surgeon.

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Proforma

PROFORMA

Name :
Age :
Sex :
IP No. : PS No :
Address :

Stage I Stage II Stage III

DOA :
DOS :
DOD :

I. HISTORY:

1.Mode of Injury:

- Trauma
- Bite
- Burns
- Keloid
- Infection
- Tumours

2.Acute /Delayed
3. Smoking
4. Risk factors
5. Previous related surgeries
6. Infection

II. CLINICAL EXAMINATION:

1. Laterality
2. Location of defect

3. Extent of defect
4. Size
    a. Normal ear:
    b. Affected ear:
    c. Defect size:
5. Planning with template :
6. Investigations
    a. Hb% :
    b. TC :
    c. Blood Sugar:
    d. Blood Urea :
    e. Serum Creatinine :
    f. HIV I & II Antibodies :
    g. Chest X-Ray :
    h. ECG :
    i. Wound swab C&S:
7. Pre operative Photograph:
8. Preoperative treatment:
9. Operative procedure performed:
10. Cartilage harvest site :
11. Post operative complications:

A. Immediate:

Haematoma
Infection
Facial Nerve Injury
Suture line complications
Seroma

B. Late :

Partial skin loss
Pressure necrosis
Venous congestion of flaps
Keloid formation in donor site

12. Day of drain removal
13. Number of stages
14. Outcome assessment

Subjective :

Contour
Colour match
Bulkiness
Donor site morbidity
Number of stages of reconstruction
Overall satisfaction

Excellent	: 5
Good	: 4
Fair	: 3
Poor	: 2
Unacceptable	: 1

Objective :

Contour
Colour match
Bulkiness
Donor site morbidity
Number of stages of reconstruction
Overall satisfaction

Excellent	: 5
Good	: 4
Fair	: 3
Poor	: 2
Unacceptable	: 1

Master Chart

MASTER CHART

S.No.	Name	Age	Sex	Etiology	Laterality	Location of defect	Extent of defect	Size of defect
01	Mrs.M	40	F	Dog bite	Right	Lower Third	Full thickness	2.5x1 cm
02	Mr.R	60	M	Assault	Left	Lower Third	Full thickness	4x2.7 cm
03	Master	15	M	RTA	Right	Upper Third	Cut. cover	1.8x1.3 cm
04	Ms.S	25	F	Infection	Right	Middle & Lower	Full thickness	3.5x3 cm
05	Mr.R	18	M	RTA	Right	Middle Third	Cut. cover	1.3x1 cm
06	Mrs.J	48	F	Keloid	Right	Middle & Lower	CC&C	6x2.1 cm
07	Mrs.M	27	F	Burns	Right	All	CC&C	4.2x1 cm
08	Mr.M	25	M	H.Bite	Right	Middle Third	Full thickness	4x1.7 cm
09	Mr.R	26	M	FFH	Left	All	Full thickness	6x1.4 cm
10	Mr.M	23	M	H.Bite	Left	All	CC&C	6x2.4 cm
11	Mr.T	35	M	H.Bite	Left	Upper & Middle	Full thickness	5x1.1 cm
12	Mr.M	50	M	H.Bite	Right	Middle & Lower	Full thickness	4.6x1.2 cm
13	Mr.N	23	M	H.Bite	Left	Middle Third	Full thickness	4.9x0. 7 cm
14	Mr.R	24	M	H.Bite	Right	Middle Third	Full thickness	4.4x1.1 cm
15	Mr.T	23	M	RTA	Left	All	Full thickness	5.7x3.2 cm
16	Mr.V	54	M	H.Bite	Right	Lower Third	Full thickness	1.8x1.1 cm
17	Mr.S	62	M	Dog bite	Left	Upper & Middle	CC&C	4.2x0.3 cm
18	Mr.R	54	M	H.Bite	Right	Upper Third	Full thickness	2.4x0.7 cm
19	Mr.S	26	M	RTA	Left	Upper & Middle	Full thickness	4.2x3.1 cm
20	Mr.P	49	M	Assault	Right	Middle Third	CC&C	3.2x1.2 cm

MASTER CHART

S.No.	Name	Age	Sex	Risk Factors	Type of surgery	Stages
01	Mrs.M	40	F		Auriculo mastoid flap	3
02	Mr.R	60	M	Smoking	Inferiorly based Cervical flap	3
03	Master	15	M	...	TemperoParietalFascia Flap with SSG	2
04	Ms.S	25	F	...	Coastal CG ,Pre auricular flap & transverse cervical tubed flap	4
05	Mr.R	18	M	...	Local transposition flap	1
06	Mrs.J	48	F	Hypertension	Injection triamcinolne & Intralesional excision	1
07	Mrs.M	27	F	...	Preauricular flap with V-Y advancement flap	1
08	Mr.M	25	M	...	Dieffenbach technique	2
09	Mr.R	26	M	...	Retroauricular flap	4
10	Mr.M	23	M	...	Complex laceration- skin to skin repair	1
11	Mr.T	35	M	Smoking	Retroauricular flap	3
12	Mr.M	50	M	Smoking	Retroauricular flap	3
13	Mr.N	23	M	...	Dieffenbach technique	2
14	Mr.R	24	M	...	Dieffenbach technique	3
15	Mr.T	23	M	...	Coastal CG, TemperoParietalFascia Flap	2
16	Mr.V	54	M	Smoking	Retroauricular flap	2
17	Mr.S	62	M		Complex laceration- skin to skin repair	1
18	Mr.R	54	M	Smoking & DM	Davis conchal chondrocutaneous flap	2
19	Mr.S	26	M	...	Coastal CG, TemperoParietalFascia Flap	1
20	Mr.P	49	M	__	Complex laceration - skin to skin repair	1

MASTER CHART

S.No.	Name	Ag	Sex	Complication	Management	Donor Site	Management
01	Mrs.M	40	F	Infection	IV Antibiotics	Keloid	Triamcinolone injection
02	Mr.R	60	M	...	...	Unsightly scar	Scar massage
03	Master	15	M	Scar contracture	Release & SSG		
04	Ms.S	25	F	Flap tip necrosis	Trans cervical tubed flap	Neck scar	Scar massage
05	Mr.R	18	M	___	___	___	___
06	Mrs.J	48	F	___	___	___	___
07	Mrs.M	27	F	Infection	IV Antibiotics	___	___
08	Mr.M	25	M	___	___	___	___
09	Mr.R	26	M	Flap tip necrosis	Flap revision	Unsightly scar	Scar massage
10	Mr.M	23	M	___	___	___	___
11	Mr.T	35	M	___	___	___	___
12	Mr.M	50	M	___	___	___	___
13	Mr.N	23	M	Venous Congestion	Inj Heparin	___	___
14	Mr.R	24	M	___	___	___	___
15	Mr.T	23	M	Flap tip necrosis	Retroauricular Flap	Infection	___
16	Mr.V	54	M	___	___	___	___
17	Mr.S	62	M	___	___	___	___
18	Mr.R	54	M	Flap tip necrosis	SSG	___	___
19	Mr.S	26	M	Infection	IV Antibiotics	___	___
20	Mr.P	49	M	___	___	___	___

MASTER CHART

OBJECTIVE ASSESSMENT

S.No.	Name	Age	Sex	Contour	Colour	Bulkiness	Donor Site	Stages	Overall Satisfaction
01	Mrs.M	40	F	5	4	5	2	3	4
02	Mr.R	60	M	5	4	5	2	2	4
03	Master	15	M	1	4	2	5	5	2
04	Ms.S	25	F	4	5	3	4	5	5
05	Mr.R	18	M	5	5	4	5	5	5
06	Mrs.J	48	F	5	5	5	NA	5	5
07	Mrs.M	27	F	5	5	3	5	5	5
08	Mr.M	25	M	4	5	3	5	5	4
09	Mr.R	26	M	3	4	3	3	3	3
10	Mr.M	23	M	5	5	5	NA	5	5
11	Mr.T	35	M	3	4	3	3	3	3
12	Mr.M	50	M	4	5	2	5	5	2
13	Mr.N	23	M	5	5	5	5	5	5
14	Mr.R	24	M	5	5	3	5	5	3
15	Mr.T	23	M	2	3	3	5	4	3
16	Mr.V	54	M	4	4	4	3	3	3
17	Mr.S	62	M	5	5	5	NA	5	5
18	Mr.R	54	M	2	3	3	4	4	3
19	Mr.S	26	M	2	3	3	5	5	2
20	Mr.P	49	M	5	5	5	NA	5	5

MASTER CHART

SUBJECTIVE ASSESSMENT

S.No.	Name	Age	Sex	Contour	Colour	Bulkiness	Donor Site	Stages	Overall Satisfaction
01	Mrs.M	40	F	4	4	5	2	4	4
02	Mr.R	60	M	4	5	4	2	4	4
03	Master	15	M	1	4	2	5	5	1
04	Ms.S	25	F	2	5	2	2	3	2
05	Mr.R	18	M	4	4	5	5	5	4
06	MrsJ	48	F	5	5	5	NA	5	5
07	Mrs.M	27	F	3	5	3	5	5	3
08	Mr.M	25	M	4	5	3	5	5	4
09	Mr.R	26	M	3	4	4	2	4	3
10	Mr.M	23	M	5	5	5	NA	5	5
11	Mr.T	35	M	3	5	4	4	4	3
12	Mr.M	50	M	5	5	5	5	5	5
13	Mr.N	23	M	3	5	5	5	5	4
14	Mr.R	24	M	5	5	5	5	5	5
15	Mr.T	23	M	2	3	3	4	4	2
16	Mr.V	54	M	4	4	4	4	5	4
17	Mr.S	62	M	4	5	4	NA	5	4
18	Mr.R	54	M	3	4	4	3	4	3
19	Mr.S	26	M	3	2	2	5	5	3
20	Mr.P	49	M	5	5	5	NA	5	5

Abbreviations

ABBREVIATIONS

1.	RTA	:	Road Traffic Accident
2.	H.Bite	:	Human Bite
3.	FFH	:	Fall from height
4.	Cut.cover	:	Cutaneous cover
5.	CC&C	:	Cutaneous cover and cartilage
6.	DM	:	Diabetes Mellitus
7.	SSG	:	Split Skin Graft
8.	CG	:	Cartilage Graft
9.	Trans	:	Transverse